Thoughts on Action Item # 51: Investigation into Display Differences in Traffic Information between CDTI and ATC

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Outline

- ADS-B System Functional Architecture
- Causes for Display Differences in Traffic Information between CDTI and ATC
  - ADS-B Targets
  - Non ADS-B Targets
- Conclusion
- Backup
  - Selected Requirements on Broadcast Surveillance (BCS) Function
  - Background: Selected Requirements on ATC Automation Function (ADS-B)

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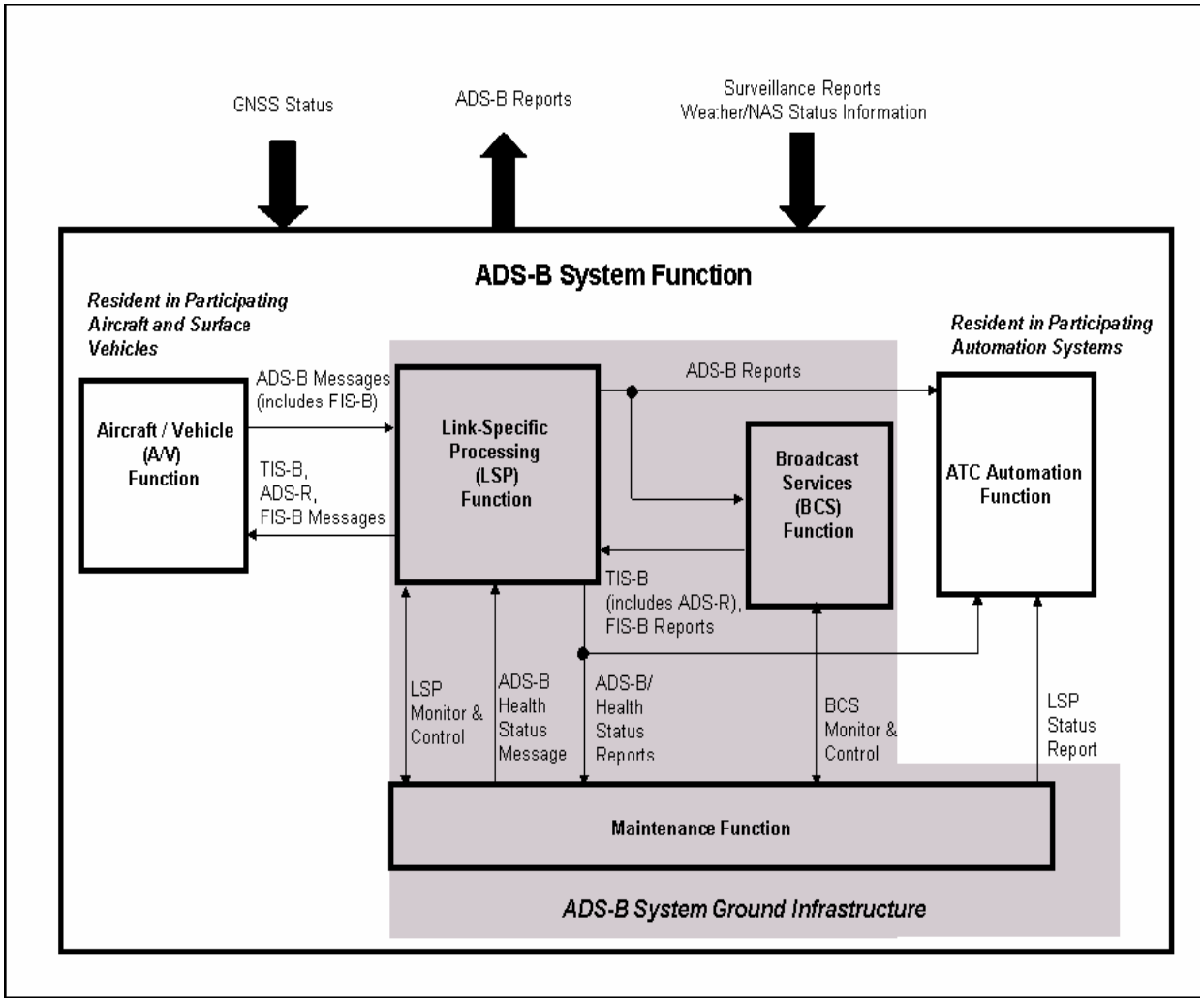
ADS-B System Functional Architecture from Final Program Requirements (fPR) Document



Causes for Display Differences in Traffic Information between CDTI and ATC: ADS-B Targets

- **Identical ADS-B target display information between CDTI and ATC cannot be guaranteed because of different requirements levied on ATC Surveillance Application vs. Air-to-Air Applications.**
  - **Different Requirements on Integrity**
    - **ATC: The ATC Automation Function shall use the *integrity and accuracy* information in the ADS-B Report to determine whether tracks should be updated with the report. (Note, currently for Capstone the MEARTS requires NIC < 4 to display ADS-B on glass.)**
      - **DO-260A compliance will be mandated for the ATC surveillance application (because integrity is used by the ATC function to determine the eligibility of a report for update).**
    - **CDTI: EVacq does not require a minimum integrity (see Note 2 of Table C-2 of ASA MASPS), targets with unknown integrity could be displayed.**
      - **DO-260 compliance has not been ruled out for air-to-air applications.**
  - **Different Requirements on Validation***
    - **ATC: The ATC Automation Function shall validate the position of ADS-B Reports with other surveillance sources when the surveillance source data is available1.**
    - **CDTI: This type of validation cannot be performed on the avionics. Therefore, the avionics could show reports that are filtered out by the ATC function.**
  - **Different Update Rates**
    - **ATC: The ATC automation may decimate the ADS-B to meet a fixed update interval. In other words, it may not show the ADS-B every second in mixed environments (i.e., radar and ADS-B). (However, it will use every ADS-B update for safety functions.)**
    - **CDTI: (1) The ASA MASPS (R3.188) requires ASSAP to deliver track reports to the CDTI with at least a 1 Hz update rate. (2) The BCS shall rate limit the ADS-R sent to the LSP to prevent overloading the data links.**

- **[1] Final Program Requirement Document**
- ***** **The purpose of validation is to detect spoofing.**

Causes for Display Differences in Traffic Information between CDTI and ATC: Non ADS-B Targets

- **Identical display information of non ADS-B targets between CDTI and ATC cannot be guaranteed for the following reasons:**
  - **Measurements vs. Tracked Data**
    - **The ATC function displays measurements (e.g., radar plots) on the Controller Display.**
    - **The BCS generates tracks from sensor inputs (i.e., TIS-B reports received by ASSAP will be track data).**
  - **Different Source Selection/ Update Rate**
    - **The surveillance sources sent to the Broadcast Services function may differ from those sent to the ATC automation function.**
      - **ATC may use a single source (Mosaic or Single Sensor Mode); the update rate may be limited to the single sensor selected.**
      - **BCS may generate a track by fusing the reports from a different set of sensors; the update rate may be higher due to fusion of multiple sensors.**

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Conclusion

- **Identical display of traffic information of ADS-B or non ADS-B targets between the CDTI and ATC cannot be guaranteed because of potential differences in data sources and differences in processing.**
- **The five applications within the scope of this MOPS are advisory and for situational awareness only. The existing control on this hazard is that the pilot must follow see and avoid rules.**
- **Steps to ensure low residual risk for this hazard:**
  - **Pilot training to avoid over-reliance on CDTI .**
  - **FAA procedures that instruct the pilot to comply with ATC instructions regardless of information presented on the CDTI.**

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Background: Selected Requirements on Broadcast Surveillance (BCS) Function*

- **The BCS Function shall receive surveillance information from multilateration primary/secondary surveillance radar systems, and ADS-B for use in generating TIS-B tracks.**
- **The BCS Function *shall* rate limit the TIS-B, ADS-R, and FIS-B Reports sent to the LSP to prevent overloading the datalinks.**
- **The BCS Function *shall* track all targets detected by radars, both primary and secondary radars (i.e. radar reinforced), and/or multilateration systems.**
- **The BCS Function *shall* generate and update a single TIS-B track from either single or multiple sensor inputs (multilateration, primary/secondary radar, or ADS-B) for a target.**
- **BCS Function *shall* generate a TIS-B Report for a target when the target's track state vector is updated by a sensor input.**
- **The BCS *shall* associate ADS-B equipped targets with TIS-B tracks.**
- **The BCS Function *shall* filter TIS-B Reports that have a corresponding ADS-B track on the same target.**

Source: Final Program Requirement for Surveillance and Broadcast Services, Version 1.0, May 9 2006

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Background: Selected Requirements on ATC Automation Function (ADS-B)*

- **The ATC Automation Function *shall* validate the position of ADS-B Reports with other surveillance sources when the surveillance source data is available.**

  Note: Validation is employed to identify erroneous ADS-B position information.
- **The ATC Automation Function *shall* use the integrity and accuracy information in the ADS-B Report to determine whether tracks and safety functions should be updated with the report.**
- **The ATC Automation Function *shall* use valid ADS-B Reports as a surveillance source to create or update tracks.**

Source: Final Program Requirement for Surveillance and Broadcast Services, Version 1.0, May 9 2006

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